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Transseptal mitral valve-in-ring implantation — description of the first procedure in Poland

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Surgical intervention is the gold standard for treatment for severe and symptomatic mitral regurgitation despite guideline-directed medical therapy [1]. Even though these procedures demonstrate good clinical results, in some patients their effectiveness may be limited over a period of time [2]. After performed valve repair, mitral regurgitation can recur due to continuous remodeling of the left ventricle or due to device failure.

A 74-year-old man with ischemic heart failure with reduced ejection fraction (37%) and severe mitral regurgitation was admitted to the hospital with New York Heart Association (NYHA) III symptoms class. Seven months before admission patient underwent mitral annuloplasty with the use of an annuloplasty ring Edwards Physio 1 34 mm. Simultaneously were performed tricuspid annuloplasty (MC3 Tricuspid Annuloplasty Ring 36 mm; Edwards Lifesciences, Irvine, CA, US), left atrial appendage resection and pulmonary veins ablation. His co-morbidities include prior implantation of dual-chamber peacemaker due to tachycardia-bradycardia syndrome (2020), myocardial infarctions treated with percutaneous coronary intervention with drug-eluting stent implantation in left anterior descending artery (2005), left

anterior descending artery and diagonal branch (2019), chronic kidney disease stage 3 and hypertension.

Preprocedural transesophageal echocardiography showed restriction of the posterior mitral leaflet resulting in failure of coaptation and secondary severe mitral regurgitation. Due to symptomatic valvular dysfunction and high surgical risk, patient was considered as a candidate for mitral valve-in-ring implantation. Computed tomography was performed in order to assess anatomical conditions. Particularly, the shape and area of the left ventricle outflow tract (LVOT), the length of the anterior mitral leaflet and angulation between mitral ring and aortic valve were taken under consideration to assess the risk of LVOT obstruction after the procedure. In the presence of appropriate anatomical conditions, by the decision of the Heart Team, patient was referred for mitral valve-in-ring implantation.

The procedure was performed (03.2021) from right femoral vein access. By the transeptal puncture, after balloon septostomy, Edwards Sapien 3 29 mm bioprosthesis was introduced into the mitral annuloplasty ring. Appropriate position and optimal implantation were achieved. Angiography showed successful implantation without the leak. Transesophageal echocardiography revealed the correct function of the valve with a trace of valvular leak near the anterior commissure between the ring and valve S3, V_{max} 1.6 m/s, pressure gradient max/mean 11/5 mm Hg, mitral valve area 1.7 cm^2, small iatrogenic atrial septal defect. Imaging excluded interaction with LVOT and particularly important LVOT obstruction.

Numerous patients undergoing mitral valve repair may require surgery redo with the significantly burdened ones considered as a high surgical risk and oftentimes disqualified from reoperation. An emerging treatment method for them is a transcatheter mitral valve-in-ring procedure. In this patient surgically implanted Physio 1 ring, which is a complete semi-rigid ring, created appropriate technical conditions for anchoring Sapien 3 valve. Usually, incomplete or complete rigid rings are unfavorable for Sapien implantation. For patients with significant LVOT obstruction risk based on computed tomography simulation usually surgical redo should be considered or rarely anterior leaflet transcatheter splitting (LAMPOON) could be applied.

The vast majority of transcatheter valve implantation is performed in the aortic position. Moreover, due to its safety and effectiveness, it is approved for treating degenerative aortic bioprosthesis (valve-in-valve implantation) [3]. Based on these experiences, it is feasible to implant a bioprosthetic valve dedicated to transcatheter aortic valve implantation into failed mitral bioprosthesis or dysfunctional annuloplasty ring, which creates a therapeutic alternative for an open-heart surgery redo in a selected group of high-risk patients.

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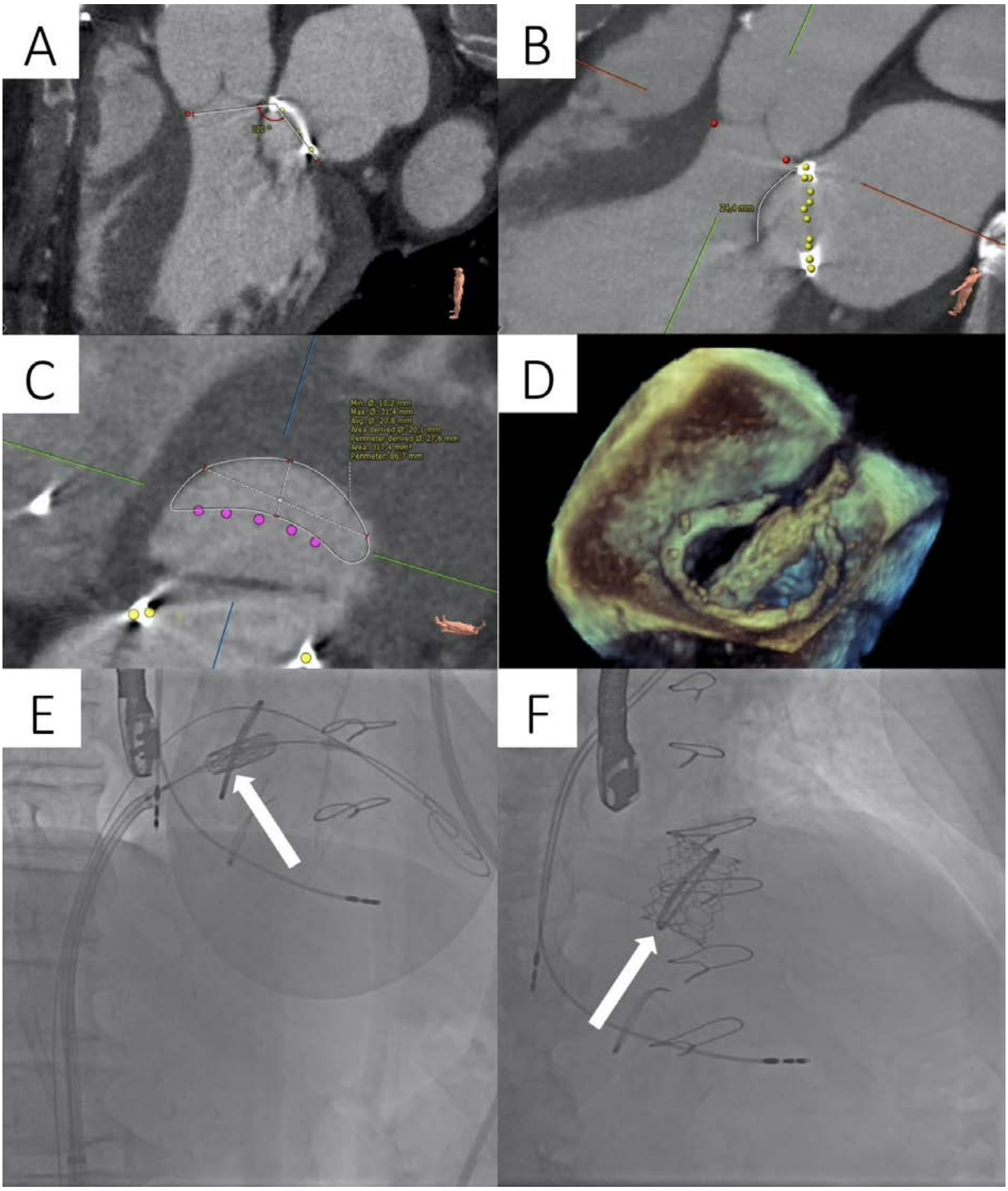

Figure 1. Assessment of the anatomical conditions visualized in CT (**A–C**), angulation between the mitral valve and the aortic valve (**A**), measurement of the anterior mitral leaflet (**B**, white line), simulation of the neo-LVOT (predicted LVOT after S3 valve implantation) and its measurements (**C**). Procedural navigation (**D–F**), positioning of the prosthetic valve visualized in transesophageal echocardiography (**D**) and fluoroscopy (**E**, white arrow). Effect of the procedure- optimal position of the prosthetic valve in the annuloplasty ring (**F**, white arrow)
Abbreviations: CT, computed tomography; LVOT, left ventricle outflow tract